

[54] MULTI-CYCLE, ENGINE BRAKING WITH POSITIVE POWER VALVE ACTUATION CONTROL SYSTEM AND PROCESS FOR USING THE SAME

[75] Inventors: Gheorghe Cosma, Windsor; James Usko, North Granby, both of Conn.

[73] Assignee: Diesel Engine Retarders, Inc., Wilmington, Del.

[21] Appl. No.: 08/997,610

[22] Filed: Dec. 23, 1997

[51] Int. Cl.⁶ F02D 13/04

[52] U.S. Cl. 123/321

[58] Field of Search 123/320, 321, 123/322

[56] References Cited

U.S. PATENT DOCUMENTS

3,220,392	11/1965	Cummins .	
4,572,114	2/1986	Sickler .	
4,688,384	8/1987	Pearman et al. .	
5,117,790	6/1992	Clarke et al.	123/321
5,146,890	9/1992	Gobert et al. .	
5,150,678	9/1992	Wittmann et al.	123/321
5,183,018	2/1993	Vittorio et al. .	
5,404,851	4/1995	Neitz et al.	123/321
5,406,918	4/1995	Joko et al.	123/321
5,460,131	10/1995	Usko et al.	123/321

5,477,824	12/1995	Reedy .	
5,479,890	1/1996	Freiburg et al. .	
5,537,976	7/1996	Hu .	
5,586,331	12/1996	Vittorio .	
5,619,965	4/1997	Cosma et al. .	
5,626,116	5/1997	Reedy et al. .	
5,680,841	10/1997	Hu	123/321
5,692,469	12/1997	Rammer et al.	123/321
5,724,939	3/1998	Faletti et al.	123/321
5,803,038	9/1998	Ihara et al.	123/321
5,816,216	10/1998	Egashira et al.	123/321
5,829,397	11/1998	Vorih et al.	123/321
5,839,453	11/1998	Hu	123/321

Primary Examiner—Erick R. Solis

Attorney, Agent, or Firm—Collier, Shannon, Rill & Scott, PLLC

[57] ABSTRACT

An apparatus and method for effectuating multi-cycle engine braking is disclosed. The present invention controls the operation of the engine valves to permit more than one compression release event during a single engine operating cycle. The apparatus includes an assembly for operating at least one exhaust valve of an engine cylinder during a positive power operation. The apparatus further includes an assembly for operating at least one intake valve of the engine cylinder. The apparatus further including an assembly for operating the at least one exhaust valve during an engine braking operation.

21 Claims, 14 Drawing Sheets

1001392 123/321